19 Cool Chemical Reactions that Prove Science is Fascinating

Chemical reactions never fail to amaze us, and these 19 picks are some of the most astonishing ones out there.

By Kashyap Vyas
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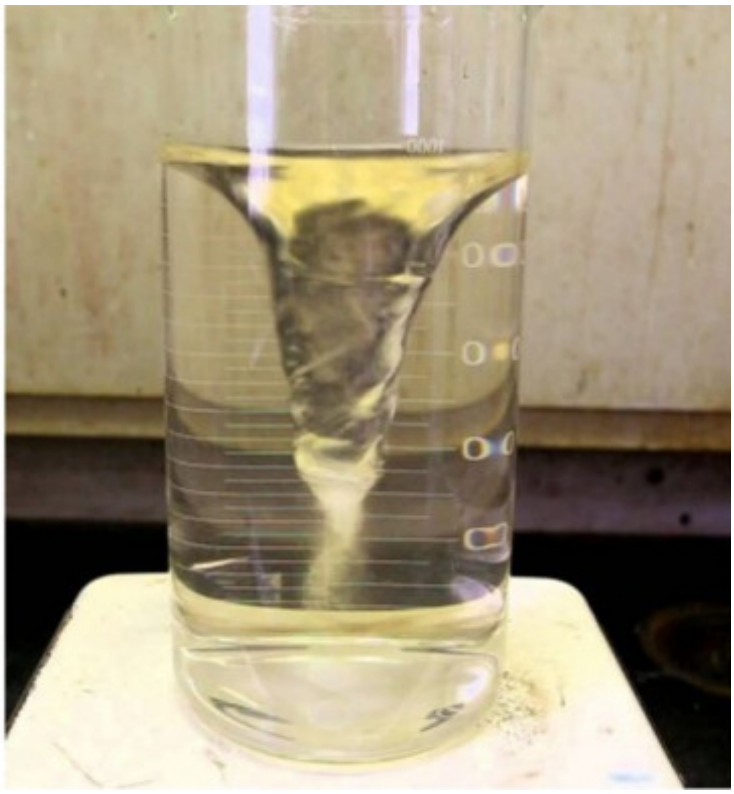

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Chemistry can be one of the most mesmerizing but also dangerous sciences. The mixing of certain chemicals can cause rather unexpected reactions that make for fun demonstrations. While some of the reactions can be observed daily, such as mixing sugar in coffee, some require controlled conditions to visualize the effects. But, there are some chemical reactions that are simply spectacular to watch and can be easily performed in chemistry labs.

For your safety though, the easiest way out is to watch the videos of such impressive chemical reactions, before you think of replicating them to understand better the level of risk involved and safety precautions required.

Here is the list of 19 most stunning chemical reactions which prove that science is always cool.

1. Sodium Polyacrylate and Water

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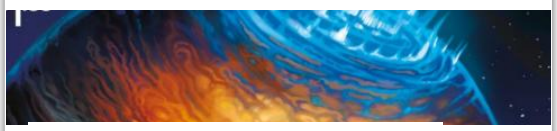

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Sodium Polyacrylate is a superabsorbent polymer. To summarize the reaction, the polymer's ions attract water by diffusion. The polymer absorbs the water within seconds resulting in the almost instantaneous transformation into a gel substance. This chemical is actually what is used in diapers to absorb the waste liquid. Technically, this isn't a chemical reaction because the chemical structure doesn't change nor is there a reaction with the water molecules. Rather, this is a demonstration of absorption on a macro scale.

2. Diethylzinc and Air

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Diethyl Zinc is a very unstable compound. When it comes in contact with the air, it burns to form zinc oxide, CO_2, and water. The reaction occurs as the Diethyl Zinc comes into contact with oxygen molecules. The chemical equation is as follows:

$$Zn(C_2H_5)_2 + 5O_2 \rightarrow ZnO + 4CO_2 + 5H_2O$$

3. Cesium and Water

Source: Giphy

Cesium is one of the most reactive alkali metals. When it comes into contact with water, it reacts to form cesium hydroxide and hydrogen gas. This reaction occurs so rapidly that a hydrogen bubble forms around the cesium, rises to the surface, which then exposes the cesium to the water causing further exothermic reaction thus igniting the hydrogen gas. This cycle repeats until all of the cesium is exhausted.

4. Calcium Gluconate

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Calcium gluconate is typically used to treat calcium deficiencies. However, when it is heated, it causes a huge expansion in the molecular structure. This results in a gray snake-like foam caused by the vaporization of water and dehydration of hydroxyl groups within the compound. In less scientific terms, when heated, calcium gluconate rapidly decomposes. The reaction is as follows:

$$2C_{12}H_{22}CaO_{14} + O_2 \rightarrow 22H_2O + 21C + 2CaO + 3CO_2$$

5. Nitrogen Triiodide

You can make this compound at home, but be aware that it is very dangerous. The compound is formed through the careful reaction of iodine and ammonia. After drying the initial components, NI3 forms, which is a very reactive compound. A simple touch of a feather will set off this highly dangerous contact explosive.

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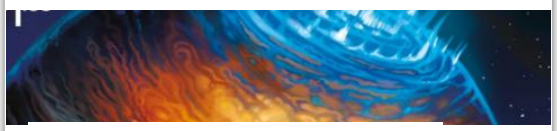

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6. Ammonium Dichromate

When ammonium dichromate is ignited, it decomposes exothermically producing sparks, ash, steam, and nitrogen.

7. Hydrogen Peroxide and Potassium Iodide

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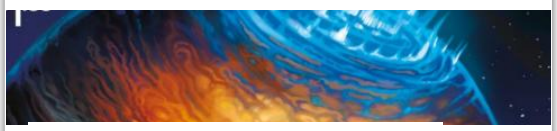

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When hydrogen peroxide and potassium iodide are mixed in proper proportions, the hydrogen peroxide decomposes very quickly. Soap is often added to this reaction to create the foamy substance as a result. The soapy water traps the oxygen, a product of the reaction, and creates many bubbles.

8. Potassium Chlorate and Candy

Gummy bears are essentially just sucrose. When gummy bears are dropped into potassium chlorate, it reacts with the glucose molecule within sucrose resulting in a highly exothermic combustion reaction.

9. Belousov-Zhabotinsky (BZ) reaction

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The BZ reaction is formed by the careful combination of bromine and an acid. The reaction is a prime example of non-equilibrium thermodynamics that results in the colorful chemical oscillations you see in the video above.

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10. Nitrogen Monoxide and Carbon Disulfide

Often referred to as the "barking dog" reaction, this is a chemical reaction as a result of the ignition of carbon disulfide and nitrous oxide. The reaction produces a bright blue flash and the obvious woofing sound. The reactants in the reaction are rapidly decomposing in the combustion process.

11. NaK Alloy and Water

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NaK alloy is a metal alloy formed by the mixing of sodium and potassium outside of air – usually under kerosene. This extremely reactive allow can react with air but an even more violent reaction occurs when it comes in contact with water.

12. Thermite and Ice

Ever thought that mixing fire and ice together could result in a boom?

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This is what happens when you take a little help from Thermite, which is a mixture of aluminum p
there's an exothermic oxidation-reduction reaction, i.e. a chemical reaction in which the energy rel
the two substances. As such when the thermite is placed on top of the ice and ignited with the help
amount of heat is released in the form of an explosion. There isn't any strong scientific theory thou
pretty clear from the demonstrating video – do not try this at home.

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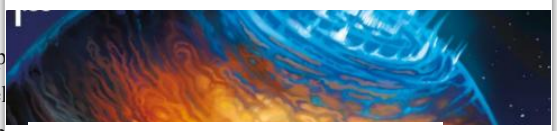
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13. Briggs-Rauscher Oscillating Clock

Briggs-Rauscher reaction is one of the very few oscillating chemical reactions. The reaction produces visually stunning effects by changing the color of the solution. To initiate the reaction, three colorless solutions are mixed together. The resulting solution will cycle while changing color from clear to amber repeatedly for 3-5 minutes and ends up as dark blue. The three solutions required for this observation are diluted mixture of Sulfuric Acid (H_2SO_4) and Potassium Iodate (KIO_3), a diluted mixture of Malonic Acid ($HOOOCCH_2COOH$), Manganese Sulfate Monohydrate ($MnSO_4$. H_2O) and vitex starch and lastly, diluted Hydrogen Peroxide (H_2O_2).

14. Supercool Water

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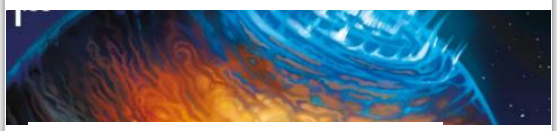

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You might not freeze the surroundings as Elsa did in the movie Frozen, but you can certainly freeze the water with a touch with this cool science experiment. The super cool water experiment is about cooling purified water to -24°C (-11°F). Once chilled, the bottle can be slowly taken out and tapped at the bottom or at the sides to kick the crystallization process. Since purified water has no impurities, water molecules have got no nucleus around to form solid crystals. The external energy provided in the form of a tap or hit will cause the supercool water molecules to form solid crystals through nucleation and will start a chain reaction to crystallize the water throughout the bottle.

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15. Ferrofluid

Ferrofluid is composed of nanoscale ferromagnetic particles suspended in a carrier fluid such as organic solvent or water. Originally discovered by NASA Research Center in the 1960s, as a part of an investigation to find methods to control fluids in space, ferrofluids when exposed to strong magnetic fields will produce spectacular shapes and patterns. These fluids can be prepared by combining proportions of Fe(II) salt and Fe(III) salt in basic solution to form valence oxide (Fe_3O_4).

16. The Giant Dry Ice Bubble

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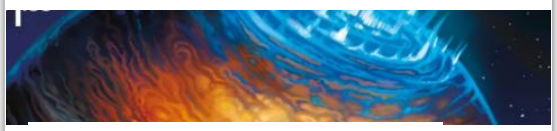
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Dry ice is always a fun-to-use substance for a variety of experiments. If you can manage to find some dry ice, try this experiment to produce a giant bubble using simple materials. Take a bowl and fill it halfway with water. Squirt liquid soap in water and stir it. Make the edges of the bowl wet using fingers and add dry ice to the solution. Dip a strip of cloth in soapy water and pull it across the entire rim of the bowl. Wait for a moment for the dry ice vapors to get trapped inside the bubble which will begin to expand gradually.

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17. The Pharaoh's Snake

Pharaoh's snake is a simple demonstration of firework. When Mercury thiocyanate is ignited, it de
breaks into another three substances. The result of this reaction is a growing snake-like column wh
compounds are toxic, the best way to perform this experiment is in a fume hood. There is also a se
however, is to watch the video, if you don't have access to the materials.

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18. The Meissner Effect

Cooling a superconductor below its transitional temperature will make it diamagnetic. It is an effect wherein the object will repulse from the magnetic field rather than drawing towards it. The Meissner Effect has also led to the concept of frictionless transportation where the object can be levitated along the track rather than attached to the wheels. This effect, however, can also be replicated in a lab. You'll need a superconductor and a neodymium magnet along with liquid Nitrogen. Cool the superconductor with liquid Nitrogen and place the magnet on top to observe the levitation.

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19. Superfluid Helium

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Cooling Helium to reach its lambda point (-271°C) will make it a superfluid is known as Helium II. This superfluid will form a thin film inside the container and will climb against gravity to seek out the warmer area. The thin film is about 30nm thick having capillary forces greater than the gravity force that would hold the liquid in the container.

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